

THE CLAIMS

What is claimed is:

1. A cranial flap clamp for fixing a bone flap to a skull comprising:
5 a first clamping member having inner and outer surfaces, at least a portion of the inner surface positionable against inferior surfaces of the bone flap and skull;
an extension member extending from the first clamping member and configured and dimensioned to fit between the bone flap and the skull;
a second clamping member having inner and outer surfaces and an opening through
10 the inner and outer surfaces for slidably receiving the extension member, with at least a portion of the inner surface positionable against superior surfaces of the bone flap and skull,
wherein movement of at least one of the first and second clamping members from a first position with the second clamping member distal to the first clamping member to a second position with the second clamping member proximal to the first clamping member
15 urges the inner surface of the first clamping member against the inferior surfaces of the bone flap and skull and urges the inner surface of the second clamping member against the superior surfaces of the bone flap and skull; and
{ a stop provided by mechanical deformation of the extension member at a surgeon selected location along its length and adjacent the outer surface of the second clamping
20 member when the first and second clamping members are in the second position to secure the inner surface of the first clamping member against the inferior surfaces of the bone flap and skull and the inner surface of the second clamping member against the superior surfaces of the bone flap and skull.

25 2. The cranial flap clamp of claim 1 wherein the inner surfaces of the first and second clamping members are substantially smooth.

3. The cranial flap clamp of claim 2 wherein the inner surfaces of the first and second clamping members are concave with the first and second clamping members in the
30 first position and the inner surfaces of the first and second clamping members flatten out when the first and second clamping members are in the second position.

4. The cranial flap clamp of claim 3 wherein the second clamping member has a disk shape with a plurality of cutouts extending radially from the opening.

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5. The cranial flap clamp of claim 1 wherein the extension member is a tube and the stop comprises a crimp in the tube.

6. The cranial flap clamp of claim 5 wherein the extension member includes a head located at a distal end and the first clamping member includes a bore for slidably receiving the extension member, the head engaging edges of the bore to prevent the first clamping member from sliding off the extension member.

7. The cranial flap clamp of claim 6 wherein the tube has an enlarged portion near the inner surface of the first clamping member for preventing movement of the first clamping member along the tube away from the head.

8. The cranial flap clamp of claim 5 wherein, when the first and second clamping members are in the first position, the tube includes a flared proximal portion for preventing the second clamping member from sliding off the tube.

9. The cranial flap clamp of claim 5 wherein the opening has a substantially circular shape which is smaller than the crimp.

20 10. The cranial flap clamp of claim 9 wherein the opening includes a countersink for receiving the stop and the stop fits substantially within the countersink.

25 11. The cranial flap clamp of claim 1 wherein the extension member is a ribbon and the opening of the second clamping member has a rectangular shape.

12. The cranial flap clamp of claim 11 wherein the stop comprises a twisted portion of the ribbon.

30 13. The cranial flap clamp of claim 12 wherein the second clamping member is provided with a recessed area surrounding the opening, wherein the stop fits substantially within the recessed area.

14. The cranial flap clamp of claim 13 wherein the recessed area has a width that increases from the center of the opening, a depth that increases from the center of the

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opening and edges which form a cutting surface so that the stop may be formed by twisting and shearing of the ribbon.

15. The cranial flap clamp of claim 11 wherein the extension member is integral
5 with the first clamping member.

16. The cranial flap clamp of claim 11 wherein the second clamping member has
at least one fastener hole for receiving a fastener.

10 17. A securing instrument for the cranial flap clamp of claim 1 comprising:
first and second pivotally connected handles, each of said handles having proximal
and distal portions;
a gripping arm operatively connected with the first handle and having proximal and
distal portions;

15 a tensioning arm operatively connected with the second handle and having proximal
and distal portions, the gripping and tensioning arms movable in response to movement of
the first and second handles;
a slot extending through the distal portions of the gripping and tensioning arms for
receiving the extension member of the cranial flap clamp;

20 a clamping element operatively associated with the slot and having active and
inactive configurations, the inactive configuration allowing sliding of the extension member
through the slot and the active configuration clamping a portion of the extension member
against a wall of the slot to inhibit sliding of the extension member through the slot; and
a crimping assembly operatively associated with at least one of the gripping and
25 tensioning arms for crimping the extension member,
wherein pivoting of the first and second handles causes the gripping and tensioning
arms to separate with the tensioning arm engaging the outer surface of the second clamping
member and the clamping element in the active position thereby moving the first and
second clamping members from the first position to the second position.

30 18. The securing instrument of claim 17 wherein the clamping element
comprises a clamp rotatably coupled to the gripping arm and wherein rotation of the clamp
within the slot upon separation of the gripping and tensioning arms moves the clamping
element from the inactive configuration to the active configuration.

~~19.~~ The securing instrument of claim 18 further comprising a resilient member biasing the clamping element in the active configuration when the gripping and tensioning arms are separated.

~~5~~ ~~20.~~ The securing instrument of claim 19 wherein the tensioning arm includes a foot maintaining the clamping element in the inactive configuration when the gripping and tensioning arms are in contact.

~~10~~ ~~21.~~ The securing instrument of claim 20 wherein the foot includes a ramped surface.

~~22.~~ The securing instrument of claim 17 wherein the distal portion of the tensioning arm includes a grooved end and the crimping assembly comprises:
a slider having a crimping edge for crimping the extension member and sides
~~15~~ configured and dimensioned for sliding in the grooved end of the tensioning arm;
a link operatively associated with the tensioning arm for sliding movement with respect thereto, the link having a distal end coupled to the slider and a proximal end with teeth; and
a lever having a distal end rotatably coupled to the proximal portion of the
~~20~~ tensioning arm, the distal end having teeth engaging the teeth of the distal end of the link.

~~25~~ ~~23.~~ The securing instrument of claim 22 wherein the crimping assembly includes a cutting stop, the cutting stop cooperating with the crimping edge of the slider to crimp and cut the extension member.

~~24.~~ The securing instrument of claim 17 wherein:
the gripping arm further comprises an intermediate portion located between the gripping arm proximal and distal portions with the gripping arm proximal portion extending from the distal portion of the first handle, the distal portion of the gripping arm extending
~~30~~ from the intermediate portion substantially parallel to the proximal portion, and the intermediate portion angling from the gripping arm proximal portion and;
the tensioning arm further comprises an intermediate portion located between the tensioning arm proximal and distal portions with the tensioning arm proximal portion extending from the distal portion of the second handle, the distal portion of the tensioning

arm extending from the intermediate portion substantially parallel to the proximal portion, and the intermediate portion angling from the tensioning arm proximal portion.

25. The securing instrument of claim 17 further comprising a resilient element located between the first and second handles biasing the first and second handles away from each other.

26. The securing instrument of claim 25 further comprising:
a locking bar having a first end pivotably coupled to the first handle and a curved body portion with a plurality of teeth; and
a locking clip pivotably coupled to the second handle and having a through channel, wherein the locking clip is movable between a free position in which the locking bar is moveable in and out of the channel and a ratchet position in which the teeth of the locking bar engage an edge of the channel to prohibit the locking bar from moving out of the channel.

EFFECTIVENESS

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